13 June 2018: Transportation Working Group

Applying Scrum Methods in Intelligent Transportation Systems (ITS) Projects

Jesse Glazer
FHWA

Barbara Staples
Noblis

Blake Christie
Retired
Webinar Plan:

- Regular webinars at fixed, predictable days & time
- Organized by the following INCOSE Working Groups (alphabetical order):
  - Automotive Working Group (AWG)
  - Critical Infrastructure Protection and Recovery (CIPR)
  - Infrastructure Working Group (IWG)
- Transportation Working Group (TWG)
  - Round robin approach
  - Monthly basis, usually second Wednesday @ 11AM ET / 8AM PT
  - One hour duration: ca. 45 min presentation, 10-15 min Q/A
  - Webinars recorded and uploaded to INCOSE CONNECT & INCOSE TWG YouTube
Next Webinar (July 18 2018): A System of Systems Approach to Automotive Challenges

Content:
- Discusses automotive challenges the industry is currently facing
- Provides an introduction into System of Systems Engineering (SoSE)
- Provides examples and case studies of successful SoSE
- Makes recommendations on how to address the automotive challenges applying SoSE
INCOSE Transportation Working Group (TWG) YouTube Channel
2018 International Symposium

28th Annual INCOSE International Symposium
Washington, DC, USA
July 7 - 12, 2018

Delivering Systems in the Age of Globalization

Engage with your colleagues from the Systems Engineering community!

Learn about state-of-the-art methods and essential skills for Systems Engineers.

Find out how people are making a difference with Systems Engineering.
Please post your questions under the “Public Chat” box.

To (Presenter): Your Question
Using Agile/Scrum Methods for Intelligent Transportation Systems

Prepared for: INCOSE TWG Webinar
June 13, 2018

Presented by:

Jesse Glazer
ITS Engineer
USDOT

Barbara Staples
Principal
Noblis
Presentation Topics:

Jesse:
- What is “ITS”? 
- How has ITS evolved? What’s in the future? 
- What is the role of Systems Engineering?

Barbara:
- Why did USDOT develop the report? 
- Why is it important to deployers? 
- What’s in the new USDOT Report?
What is “ITS”?...

• Short Answer = “Technology in Transportation”
• USDOT Definition = "ITS means electronics, communication, or information processing used ... to improve efficiency or safety of a surface transportation system.” (23CFR940.3)

(Excludes boats, planes & most rail.)
• Federal regs apply to federally-funded projects
• ITS is heavily dependent upon “IT” resources
Evolution of ITS
(1968 → Now)
“Transportation Technology” is >100 years old!
1970’s – Freeway Traffic Management

Traffic Detection
“loops”

Electronic Message Signs

Ramp Meters
1980’s – *Arterial* Traffic Management
1990’s – Traffic Management Centers
2000’s – “Smart Bus” Systems

- Traffic Signal Priority
- Route Destination Display
- GPS & Vehicle ID
- Automated Fare Collection and Passenger Counting
- Smart Card Reader
- Silent Alarm
- Driver Information Display
- Vehicle Diagnostics
2000’s – Traveler Information
2010’s – Electronic Tolling & HOT Lanes
2010’s – Mobile Devices

Traffic & Navigation

Parking Info & Guidance

Ride-Hailing & Carpooling
Meanwhile, ... at the “institutional” level...
Mid-1990s:

- Created by USDOT
- Goal: Define a standard, national, interoperable, ITS framework
- Guideline for future transportation systems
- Built upon S.E. concepts & terminology
Late 1990’s – ITS Arch. & SE “Rule”

- Codified in: 23 CFR 940
- Defined ITS and ITS Projects (940.3)
- Required:
  - Regional ITS Architectures in all Urban Areas (940.9)
  - “Systems Engr. Analysis” for all ITS projects (940.11)
- Defined S.E. concepts and terminology; still widely used today.
- (Drew heavily on aerospace & I.T. concepts, terminology, and people.)
High-Risk ITS Projects Must use S.E. Process

Figure 1-2 ITS Project Life cycle Phases and the Life cycle Tasks in this Guidebook
Jesse’s Observations…

ITS Projects are increasingly complex:
- Multi-agency, multi-modal, multi-purpose
- More people “in the control loop”
- Requirements much less foreseeable.

Less hardware, more software:
- SW development difficult to manage
- SW requires a lot of maintenance
- Ever-changing security threats

→ Need more flexible development tools!
What’s the Future of ITS?
Self-Driving (“Autonomous”) Vehicles

(under private-sector leadership)
Vehicles will also be “Connected” (USDOT leadership)

... connected to each other on freeways:
... and on surface streets ("V2V") ...
... and connected to roadway ("V2I")
... and to peds, bikes, etc. (V2X)
Vehicles must also cooperate
Jesse’s Prediction for “ITS in 2068”

Automated, Connected, Cooperating, Electric Vehicles

• No traffic congestion
• No crashes
• No air pollution/GHG
• No driving stress
• Mobility for all
New USDOT Report …

Applying Scrum Methods to ITS Projects

www.its.dot.gov/index.htm
Final Report — August 2017
Publication Number: FHWA-JPO-17-508

https://rosap.ntl.bts.gov/view/dot/32681
Report Development Team

**USDOT** – Kingsley Azubike, Ed Fok, Jesse Glazer

**Noblis** – Barbara Staples, Blake Christie, Dawn Hardesty, Taylor Deurbrouck, Josh Seder

**ConSysTec** – Manny Insignares, Patrick Chan

Also thanks to TWG for 2016 “Agile in ITS” webinar: Simon Smith, Phyllis Marbach, Jean Souza, Jennifer Russell.
Barbara Staples will describe the Report
Please post your questions under the “Public Chat” box

To (Presenter): Your Question
Purpose of Presentation

• Introduce *Applying Scrum Methods to ITS Projects*
  • When and how to use Scrum methods in Systems Engineering
  • Why Important to you and deployers
FHWA Initiative

• Why did FHWA develop the document?
  Constituents asking about using agile

• Why important to you and deployers?
  Scrum being used and likely to continue
  Combine Scrum with systems engineering within 23 CFR 940.11
  Consistent application regarding 23 CFR 940.11
  Share information with State/local transportation agencies

Covered in Executive Summary, Sections 1 and 9.2
Compatibility with Federal Regulations

• Applying Scrum Methods within the Vee is consistent with FHWA SE guidebooks for ITS projects
  • Systems Engineering Guidebook for Intelligent Transportation Systems, Version 3.0
  • Systems Engineering for Intelligent Transportation Systems: An Introduction for Transportation Professionals

• The Vee Model (recommended by the guidebooks) with Agile development are compatible with 23 CFR 940.11 – when used properly
  • The Vee Model is compatible with 23 CFR 940.11
  • Agile (Scrum) is compatible with 23 CFR 940.11 when used within a proven Vee Model context

Covered in Sections 1.2 and 7
Intended Audience & Warning

- Two primary audiences
  - State and local transportation agencies
  - FHWA Division Office staff
- Decision-makers within these two groups
- Contractors/System integrators supporting State/local agencies

Those unfamiliar with SE or Agile methods should consult appropriate resources before proceeding

Source: Noblis 2017

Covered in Sections 1.1 and 3
Two Key Take-Aways

1. Can I use Scrum with traditional systems engineering?

   Project suited to consider use of Agile (or Scrum) include:
   - Client vision is incomplete and needs fleshing out
   - Upgrade to existing systems is well understood
   - New human interfaces
   - Web sites
   - Functionality that can be delivered incrementally

   Project not suited to use Agile (or Scrum) include:
   - Safety critical or safety of life features/functions
   - Long-term maintenance and thoroughly documented project design decisions required legally
   - Integration of disparate systems

Covered in Executive Summary and Section 3
Two Key Take-Aways (continued)

2. Several challenges need to be addressed by those seeking to use Agile methods (or Scrum)
   • Consider the skill set, staff knowledge, and resources required
   • Consider the contracting needs and agency’s procurement regulations
   • Agile is new to ITS community; implementation still evolving

Covered in Executive Summary and Section 3
What are the benefits of combining SE and Scrum?

• Can provide a holistic and cost-effective approach
• SE provides set of requirements for the overall system and allows for flexibility within the Scrum method.
• SE brings the comprehensive documentation needed for safety critical and maintaining systems
• Requirements developed in SE portion improves communication between design/implementation and test teams

Covered in Sections 3.2, 4.1, and 5
New USDOT Paper on Applying Scrum within System Engineering

• What this document covers:
  • Using Scrum development as complement to SE
  • Introduces Scrum
  • Monitoring and Controlling quality when using Scrum
  • Common benefits, risks and lessons learned

Covered in Executive Summary and Section 1
Combining Scrum and Systems Engineering

The process in this figure is fully described in Section 4.
How to use this document

• State and Local Agency
  • Practitioners read Executive Summary and Sections 1, 2, 3, 4, 6 and 8
  • Decision makers read Executive Summary

• FHWA Division Staff
  • Staff read Executive Summary and Sections 1, 2, 3, 5, 6, 7, and 9
  • Decision makers read Executive Summary

• State or Local Agency Consultants/Contractors
  • Read the ENTIRE document

Covered in Section 1.3
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<td>Fundamentals of SE, Scrum Development, and the Vee Model</td>
<td>Summarizes fundamentals of SE and the Vee Model; describes the Scrum methodology; and introduces the concept of combining each.</td>
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<td>Getting Started - Why and When to Use Agile</td>
<td>Guides PMs through decision making process for when and where to use Agile (Scrum Method).</td>
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<td>How Agile (Scrum method) fits into the Vee Model –</td>
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<td>Explains activities that will cut across all SE and Agile methods that should be considered to successfully manage system development.</td>
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To (Presenter): Your Question
GlobalMeet Participant Features:

- Mute / Un-mute *6
- Increase volume *4
- Decrease volume *7
- Increase microphone *5
- Decrease microphone *8